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ANALYSIS OF MEDICAL EVENTS AMONG BATTLEFIELD AIRMEN TRAINEES

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14. ABSTRACT

United States Air Force Battlefield Airmen (BA) are an elite group of largely enlisted, male warfighters whose duties require a substantial degree of physical and mental strength, agility, stamina, and discipline. The numerous financial, material, and personnel resources required to train this group feed into a multi-location training pipeline, which can take up to 2 years per trainee to complete. The majority of those who enter the training program do not complete the program, and a subset of these noncompleters (about 15%) is related to medical events. Secondary data analyses were performed on existing training data to determine a timeline of medical events within the pipeline. Descriptive analyses were conducted to determine the number of individuals in pipelines, median pipeline length, graduation rates, number of medical events, and median day of medical event. For the 3-year period from 2008 to 2010, there were 2,837 BA who started training pipelines. Median pipeline length (in days) for graduates ranged from 105 to 708 and graduation rates ranged from 1% to 60%, depending on the career field. For nongraduates, medical events occurred as early as 5% of the way through the pipeline for one career field and as late as 30% for another career field. Medical events were characterized by examining data from the Military Health System Mart for clinic visits near the event dates and summarizing the types of medical diagnoses found. Of the 600 individuals with medical events in the 3-year period (21% of the total pipelines), 73% had corresponding medical events in the Military Health System Mart. The most common diagnosis categories were "diseases of the musculoskeletal system and connective tissue" and "injury and poisoning." The largest subcategory within "musculoskeletal" diseases was disorders of the joint, most of which were joint pain of the lower leg. The largest subcategory within "injury and poisoning" was "sprains and strains of joints and adjacent muscles," most of which were of the knee/leg.

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Special operations forces, battlefield airmen, tech trainees, elite warfighters, specialized training, training injuries, musculoskeletal injury, diagnosis codes, medical events, attrition

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1.0 SUMMARY

U.S. Air Force Battlefield Airmen (BA) are an elite group of largely enlisted, male warfighters whose duties require a substantial degree of physical and mental strength, agility, stamina, and discipline. The numerous financial, material, and personnel resources required to train this group feed into a multi-location training pipeline, which can take up to 2 years per trainee to complete. The majority of those who enter the training program do not complete the program, and a subset of these noncompleters (about 15%) is related to medical events. Secondary data analyses were performed on existing training data to determine a timeline of medical events within the pipeline. Descriptive analyses were conducted to determine the number of individuals in pipelines, median pipeline length, graduation rates, number of medical events, and median day of medical event. For the 3-year period from 2008 to 2010, there were 2,837 Battlefield Airmen who started training pipelines. Median pipeline length (in days) for graduates ranged from 105 to 708 and graduation rates ranged from 1% to 60%, depending on the career field. For nongraduates, medical events occurred as early as 5% of the way through the pipeline for one career field and as late as 30% for another career field. Medical events were characterized by examining data from the Military Health System Mart for clinic visits near the event dates and summarizing the types of medical diagnoses found. Of the 600 individuals with medical events in the 3-year period (21% of the total pipelines), 73% had corresponding medical events in the Military Health System Mart. The most common diagnosis categories were "diseases of the musculoskeletal system and connective tissue" and "injury and poisoning." The largest subcategory within "musculoskeletal" diseases was disorders of the joint, most of which were joint pain of the lower leg. The largest subcategory within "injury and poisoning" was "sprains and strains of joints and adjacent muscles," most of which were of the knee/leg.

2.0 INTRODUCTION

U.S. Air Force Battlefield Airmen (BA) are an elite group of largely enlisted, male warfighters whose duties require a substantial degree of physical and mental strength, agility, stamina, and discipline. There are four BA career fields: Pararescue Jumper (PJ), Combat Control (CCT), Tactical Air Control Party (TACP), and Special Operations Weather (SOWT).

The numerous financial, material, and personnel resources required to train this group feed into a multi-location training pipeline, which can take up to 2 years per trainee to complete. The majority of those who enter the training program do not complete their training, and a subset of these noncompleters (about 15%) is related to medical events. To our knowledge, no rigorous epidemiological analysis has identified where in the pipeline the majority of medical events are occurring. Once the place and time of injury or illness are pinpointed, preventive countermeasures can be identified and implemented. Valuable resources will be saved if training-associated injury and illness can be prevented.

Few reports are available describing analysis of injury and illness specifically among BA trainees; however, one study showed that trained BA (graduates of the training program) had increased risk of injury (Ref 1). The same group at the Air Force Research Laboratory showed BA (as compared to security forces) had a higher likelihood of being hospitalized for illness and injury (Ref 2). Studies among Army counterparts, the Rangers, describe environmental factors that increase the risk of parachuting injuries, such as night operations, dirt landing strips, and equipment weight (Ref 3 and 4). One of the most common injuries during a Ranger operation in

Panama was of the lower extremity, particularly the ankle (Ref 5). Studies characterizing injury and illness among BA and other warfighter trainees are lacking.

The technical report titled *Medical Attrition of Battlefield Airmen Trainees* found that lost training days due to medical factors were generally due to upper respiratory infections, musculoskeletal complaints, and injuries (Ref 6). The study determined some courses appeared to carry a disproportionately higher burden of training days lost and medical costs, but it did not determine a timeline of injuries within the overall pipeline. The aim of this study was to determine at what point(s) in the BA training pipeline medical events were occurring by creating a data string for each airman so that he/she could be followed through the pipeline. The day within the overall pipeline that medical events were occurring could then be determined. Data would also be examined separately for each Air Force Specialty Code (AFSC). Finally, for those who had medical events in the pipeline, the event was characterized by examining outpatient, on-base Military Health System Mart (M2) data for a specific time period.

3.0 METHODS

Secondary data analyses were performed on an existing dataset to determine a timeline of medical events within the pipeline. Training-related event data for BA [AFSCs 1T2X1 (PJ), 1C2X1 (CCT), 1C4X1 (TACP), and 1W0X2 (SOWT)] were obtained from the Technical Training Production Analysis section of the Air Education and Training Command Decision Support System. The timeframe of the data was 1 January 2008 to 31 December 2010 to allow for a full 2 years of follow-up for two class years. Data such as AFSC, airman status code and description, pipeline completion, and dates of entry/exit from the course/pipeline were obtained.

If the word "medical" was found in the status description, that determined a medical event. Pipeline length (in days) was calculated by subtracting the original class start date from the pipeline end date and adding 1. By adding 1, the first day for each airman was reset to 1.

Descriptive analyses were performed on training data to determine the number of individuals in pipelines, median pipeline length, graduation rates, number of medical events, and median day of medical event. Medical events were characterized by searching M2 for clinic visits near the event dates and summarizing the types of medical diagnoses found.

4.0 RESULTS

For a 3-year period from 2008 to 2010, there were 2,837 BA who started training pipelines: 739 in 2008, 922 in 2009, and 1,176 in 2010. Most (49%) were in the PJ pipeline, 29% were in the CCT pipeline, 20% in the TACP pipeline, and 2% in the SOWT pipeline. Median pipeline length (in days) for graduates was 708 for PJ, 361 for CCT, 105 for TACP, and 332 for SOWT. Graduation rates were as follows: 1% for PJ, 14% for CCT, 60% for TACP, and 2% for SOWT.

Six hundred individuals in the 2,837 pipelines (21%) had a medical event. Figures 1 and 2 show the proportion of medical events per pipeline for graduates and nongraduates, respectively. Only 32 (5%) of those with medical events went on to graduate from their respective pipelines. Among nongraduates, those in the TACP pipeline had a higher proportion of medical events than the other three pipelines (42% vs. 23% or less).

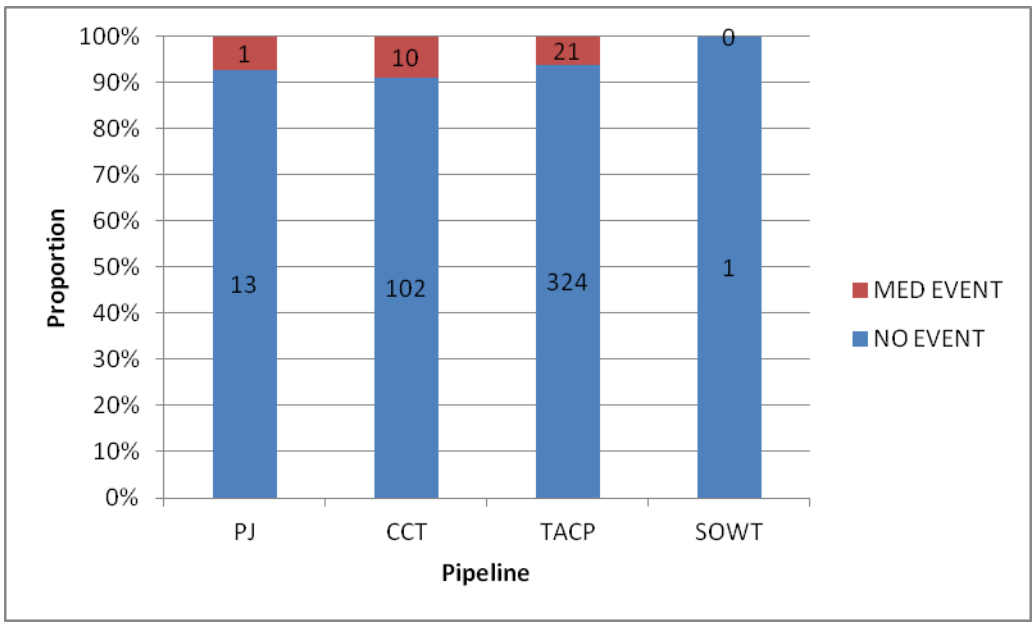

Figure 1. Proportion of Medical Events per Pipeline for Graduates

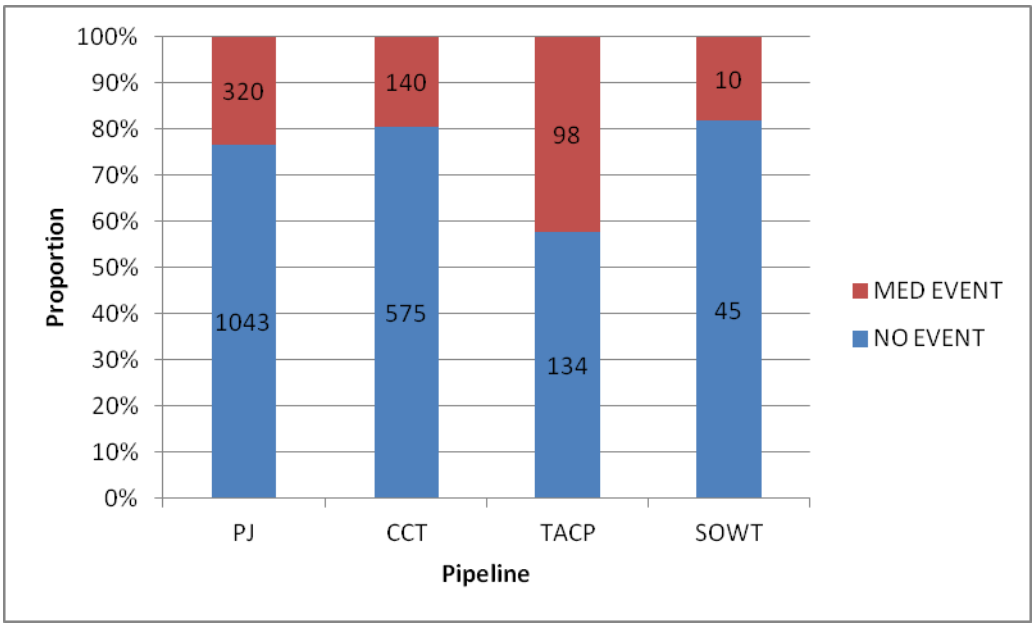

Figure 2. Proportion of Medical Events per Pipeline for Nongraduates

For nongraduates, medical events occurred early in the pipeline for PJs: median day 32 of 708, or 5% of the way through the pipeline. For the CCT pipeline, medical events occurred near day 34, but the overall pipeline was shorter (median 361 days), thus events occurred 9% of the way through the pipeline. For TACPs, the pipeline was shorter still (median 105 days); thus, events occurring near day 31 were 30% of the way through the pipeline. The SOWT pipeline only had 10 medical events, mostly near day 16, in a pipeline that was 332 days long, or 5% of the way through the pipeline (see Figures 3-6). In the three pipelines that had the most medical events (PJ, CCT, and TACP), the median day for an event was near 30 days, regardless of the length of the pipeline.

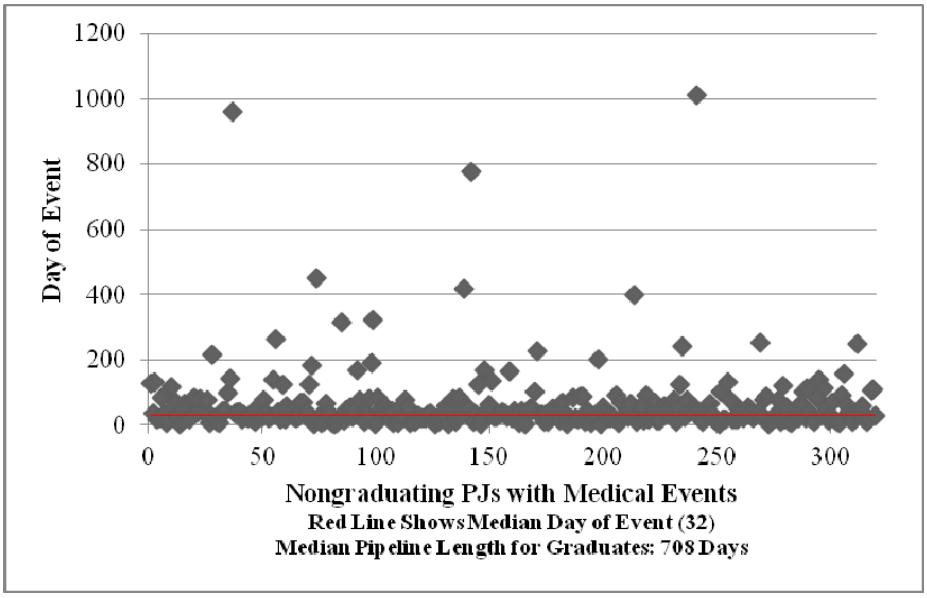

Figure 3. PJ Nongraduate Medical Events

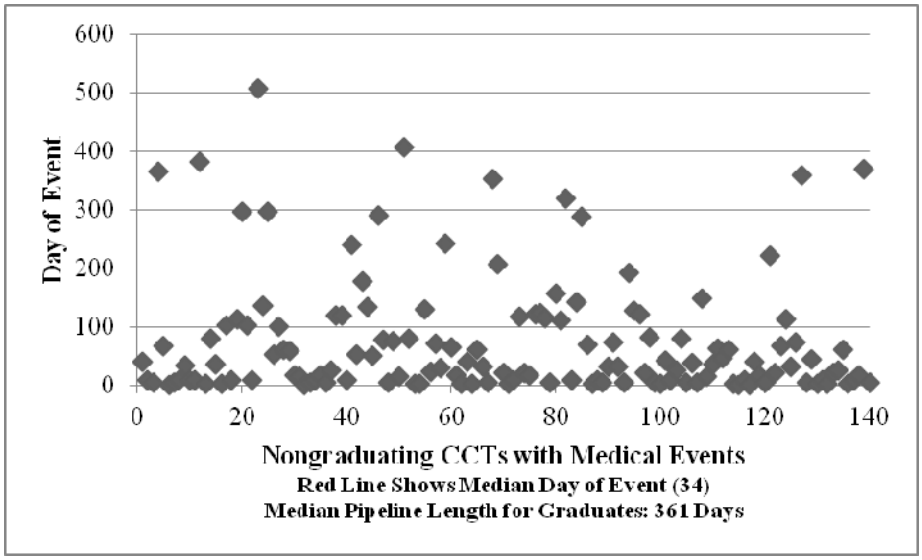

Figure 4. CCT Nongraduate Medical Events

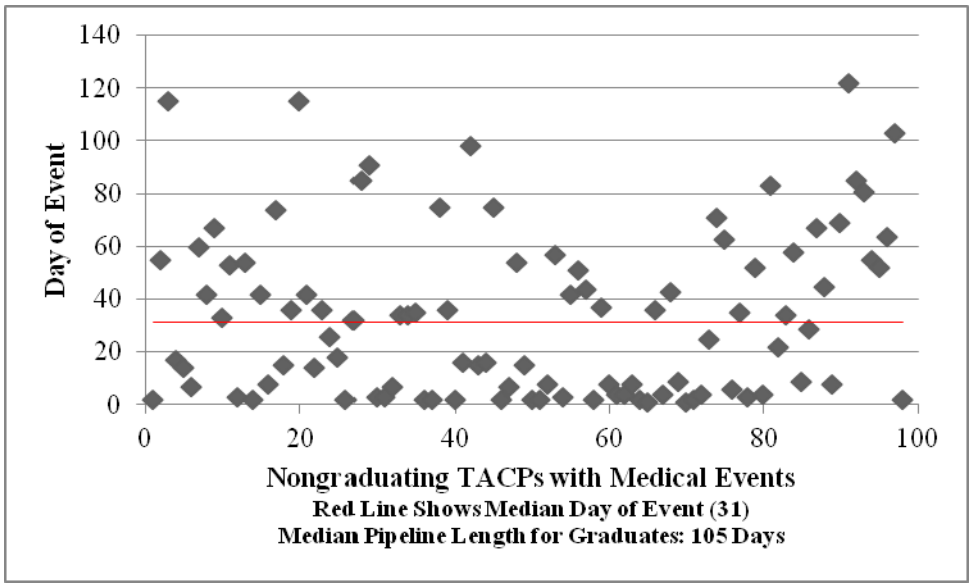

Figure 5. TACP Nongraduate Medical Events

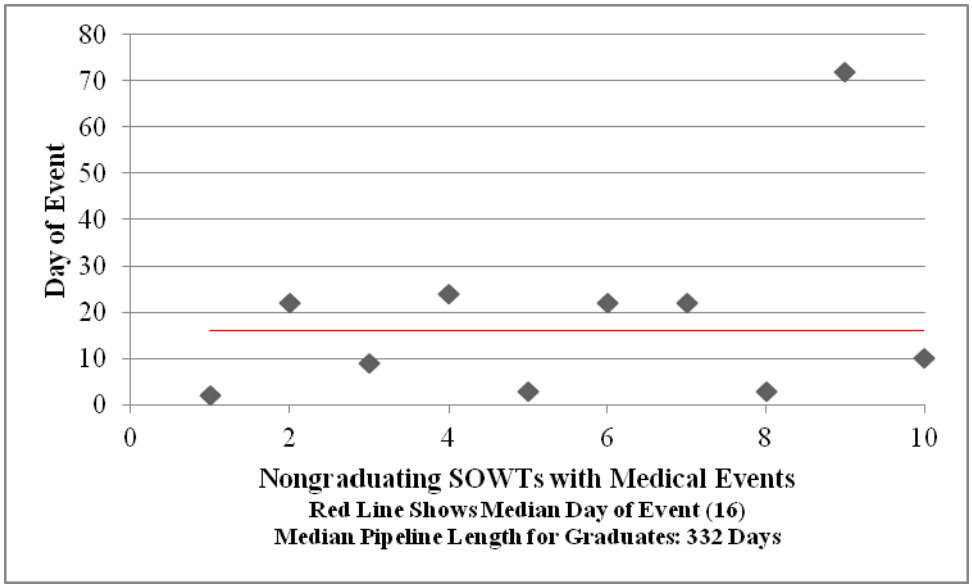

Figure 6. SOWT Nongraduate Medical Events

Medical events were investigated by month to determine if a seasonal trend was present. Events were relatively uniform for all months except December, which had a noticeable drop, likely due to the holiday season.

Of the 600 medical events in the 3-year period, 436 (73%) had corresponding medical events in M2. An event was considered "matched" if clinic data were found in M2 within 30 days prior to the medical event in the training data or if clinic data were found within 90 days after the event. Individuals had up to 14 matched visits, with the median number of visits per medical event being 4. The clinic visit closest to the event date (either before or after) was used for analysis. Both "E" and "V" codes [external causes of injury (e.g., motor vehicle accidents) and supplemental classification] were excluded from the analysis. For primary diagnosis, the most common International Classification of Diseases, 9th revision broad categories were "diseases of the musculoskeletal system and connective tissue" (178/436, or 41%), "injury and poisoning" (89/436 or 20%), and "symptoms, signs, and ill-defined conditions" (53/436, or 12%). Together, these represented 73% of clinic visits (see Table 1). Findings were similar if secondary, tertiary, and quaternary diagnoses were considered. Findings were also similar if different career fields were investigated.

Table 1. Primary Diagnosis Categories

Diagnosis Category	Frequency	Percent
Diseases of the Musculoskeletal System & Connective Tissue	178	40.83
Injury & Poisoning	89	20.41
Symptoms, Signs, & Ill-Defined Conditions	53	12.16
Diseases of the Respiratory System	46	10.55
Diseases of the Sense Organs	19	4.36
Diseases of the Digestive System	12	2.75
Diseases of the Nervous System	10	2.29
Diseases of the Skin & Subcutaneous Tissue	10	2.29
Diseases of the Genitourinary System	6	1.38
Diseases of the Circulatory System	5	1.15
Congenital Anomalies	3	0.69
Infectious & Parasitic Diseases	3	0.69
Mental Disorders	1	0.23
Neoplasms	1	0.23
Total	**436**	

The following were found within "diseases of the musculoskeletal system and connective tissue": 32 disorders of bone/cartilage, 32 disorders of soft tissues, 16 peripheral enthesopathies (disorders of bone attachments), 14 disorders of the back, and 13 disorders of muscle/ligament/fascia (see Table 2). The largest subcategory within "musculoskeletal" diseases was disorders of the joint (n=57). All but one of these was joint pain: 29 were pain of the lower leg, 10 of the shoulder, 9 of the ankle/foot, 7 of the pelvis/thigh, and 1 of the forearm.

Within "injury and poisoning," eight fractures of the lower limb, five dislocations, and four fractures of the upper limb were found (see Table 3). "Sprains and strains of joints and adjacent muscles" accounted for the majority of the "injury and poisoning" category: 64 of the 89 diagnoses. Within the subcategory of "sprains and strains," 12 were of the shoulder/upper arm, none were of the elbow/forearm, 1 was of the wrist/hand, 4 were of the hip/thigh, most (31) were of the knee/leg, 7 were of the ankle/foot, 1 was of the sacroiliac region, 5 were of the back, and 3 were unspecified.

Table 2. Diseases of the Musculoskeletal System and Connective Tissue

Diagnosis Subcategory	Frequency	
	Subtotal	Total
Disorders of the Joint		57
Joint Pain of the Lower Leg	29	
Joint Pain of the Shoulder	10	
Joint Pain of the Ankle/Foot	9	
Joint Pain of the Pelvis/Thigh	7	
Joint Pain of the Forearm	1	
Joint Stiffness of the Hand	1	
Disorders of Bone/Cartilage		32
Disorders of Soft Tissues		32
Peripheral Enthesopathies (Disorders of Bone Attachments)		16
Disorders of the Back		14
Disorders of Muscle/Ligament/Fascia		14
Disorders of Cervical Region		3
Flat Foot		3
Osteochondropathies		2
Internal Derangement of Knee		1
Other Derangement of Joint		1
Disorders of Synovium/Tendon/Bursa		1
Other Acquired Deformities of Limbs		1
Nonallopathic Lesions		1
Total		**178**

Table 3. Injury and Poisoning

Diagnosis Subcategory	Frequency	
	Subtotal	Total
Sprains & Strains of Joints & Adjacent Muscles		64
Strain/Sprain of Knee/Leg	31	
Strain/Sprain of Shoulder/Upper Arm	12	
Strain/Sprain of Ankle/Foot	7	
Strain/Sprain of Back	5	
Strain/Sprain of Hip/Thigh	4	
Strain/Sprain, Unspecified	3	
Strain/Sprain of Wrist/Hand	1	
Strain/Sprain of Sacroiliac Region	1	
Strain/Sprain of Elbow/Forearm	0	
Fracture of the Lower Limb		8
Dislocation		5
Fracture of the Upper Limb		4
Open Wound of Head/Neck/Trunk		2
Superficial Injury		2
Intercranial Injury (Excluding Skull Fracture)		1
Contusion, Intact Skin		1
Toxic Effects of Substances Chiefly Nonmedicinal		1
Other Effects External Causes		1
Total		**89**

5.0 DISCUSSION

Medical events were found in 21% of pipelines (regardless of eventual graduation status). Only 5% of those with medical events went on to graduate from their respective pipelines. Among nongraduates, those in the TACP pipeline had a higher proportion (42%) of medical events than the other three pipelines. The number of nongraduating SOWT with medical events was too small to draw conclusions (n=10). However, among nongraduating pipelines with a sufficiently high frequency of medical events (PJ, CCT, and TACP), the median day for an event was near 30 days, regardless of the length of the pipeline.

The data used for this study cannot determine if the trainee did not graduate as a result of the medical event or if nongraduation was due to some other reason. Even if all medical events resulted in attrition, the majority of attrition overall was seen in trainees who did not experience a medical event. Within those attritions that were considered medical according to the training database, over 60% were diagnosed as "musculoskeletal" or "injury" and many of those were either "joint pain" or "sprains and strains," which are relatively nonspecific diagnoses.

While the study was not quantitatively rigorous, there are few reports available describing injury specifically among Battlefield Airmen trainees; thus, information gained is useful to the Battlefield Airmen career field managers and medical support staff. While medical attrition is not the majority of attrition, any efforts to decrease attrition would save valuable resources and graduate more airmen from the training program. This would allow for a larger pool of specially trained warriors to draw from for deployments, allowing for greater recuperation time between deployments and less frequency of deployment.

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LIST OF ABBREVIATIONS AND ACRONYMS

AFSC	Air Force Specialty Code
BA	Battlefield Airmen
CCT	Combat Control
M2	Military Health System Mart
PJ	Pararescue Jumper
SOWT	Special Operations Weather
TACP	Tactical Air Control Party